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ABSTRACT

In individualized instruction, the amount of recordkeeping which must be done can be best handled by computer. In this paper, the logistics of recordkeeping in elementary education is explored through a systems approach. A model is proposed which can be used manually to keep track of progress in various skills. The model can easily be adapted to computerization. The steps in the model, including testing, diagnosis, prescription, and evaluation, are explained here and illustrated with flow charts. (JK)

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COMPUTER MANAGED PERSONALIZED LEARNING PROCESS (CMPLP)

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INTRODUCTION

One of the challenges to education in the 70's is to meet student's needs through personalized (individualized) instruction; this poses a complex logistical problem. The mass of record keeping and the problems associated with keeping track of each individual's progress have presented an almost insurmountable task to the classroom teacher. This task can of course be handled manually by adding more personnel but not as effectively and less economically (Brudner 1969) than can the computer.

The purpose of this paper is to explore the ramifications of a real time Computer Managed Personalized Learning Process (CMPLP) based on an actual case study.

The case study is composed of a new (1970-71) open space elementary school with a capacity of 850 students of age chronology 6-12 years (non graded) and 150 children (two half day sessions of 75 each) of kindergarten age (5 years) children.

The objectives of this paper are the following:

1. To explore by means of the systems approach, the logistical problem of record keeping within the elementary education process.

2. To provide a logical, instructionally sound, and flexible process which can be utilized manually in all facets of curriculum for skill area development.
3. To propose a real time, multi-media, terminal based computer managed personalized learning process (CMPLP).

THE MANUAL MODEL OF THE PERSONALIZED LEARNING PROCESS

Analysis of the logistical problems in the case study indicated that the ultimate solution would require computer utilization. However, the difficulties that were being faced necessitated a frame of reference that could be utilized for the interim period, a reference for the final computerized design, justification of the resource allocation, and implementation of the system.

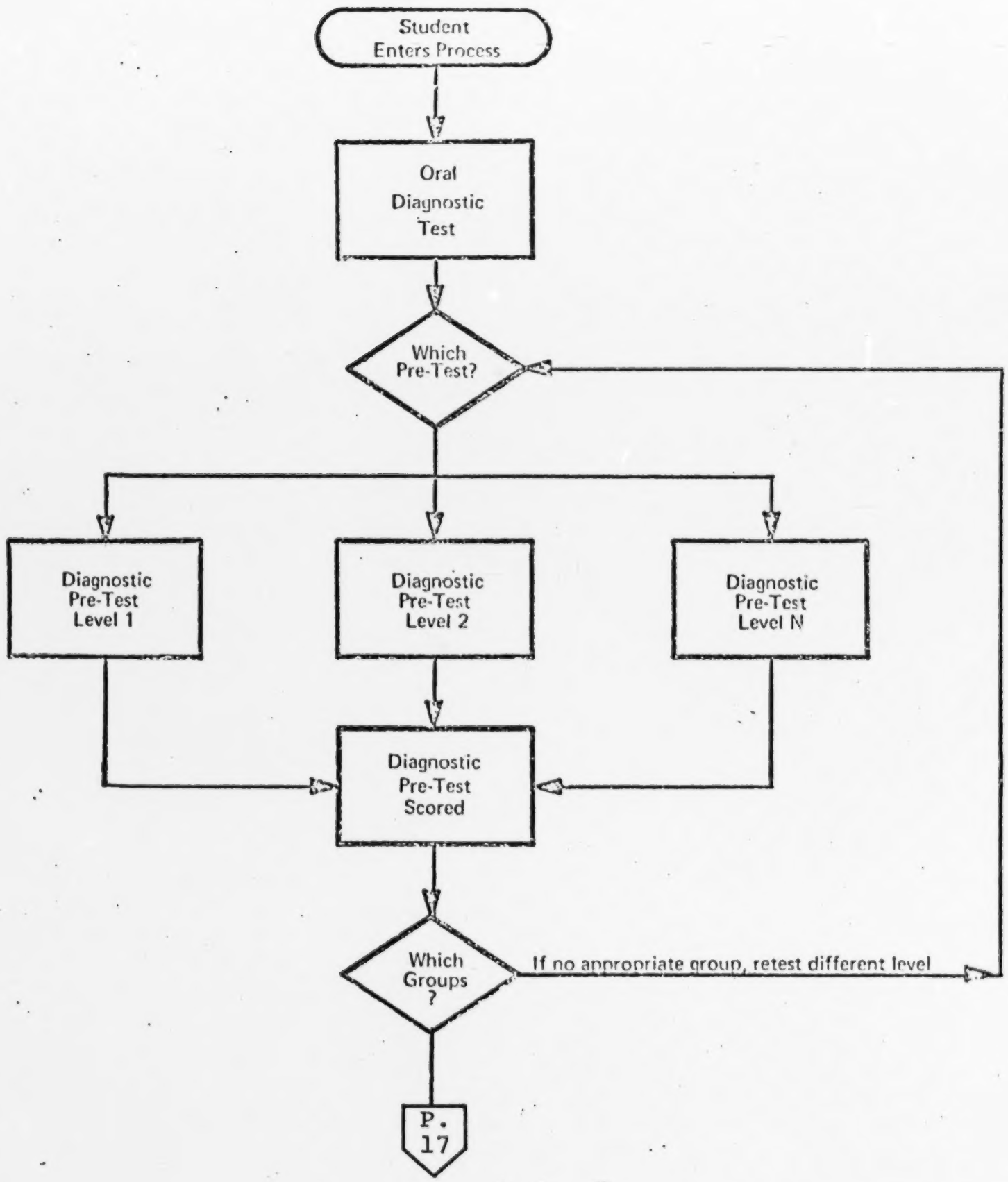
One should assume that the following explanations and flow chart are representative of one student proceeding through the personalized learning process (PLP) and particularly the reading process.

Figure 2 represents the initial phase of the process and consists of the following:

The top oval indicates a starting point, with a student entering the process either at the beginning or at any time during the school year. At this time an oral diagnostic test is given to decide at what gross skill level the student is operating. The diamond indicates that there is a decision that the diagnoser must make as to which pretest the student should take. The three rectangles indicate level 1, level 2, or any other

Figure 2

Personalized Learning Process



skill level that may be pretested. The next rectangle represents the scoring of this pretest.

The diamond shaped symbol again represents a decision, and detailed within the block is what decision is to be made. In this case one is asking to which group the student should be assigned. Theoretically, it is possible that the student completed the diagnostic test satisfactorily, in which case there would be no appropriate group to which he could be assigned and he would be retested on the next higher level. Conversely, if he did not achieve satisfactorily any portion of the initial test, he should be recycled to a lower level test.

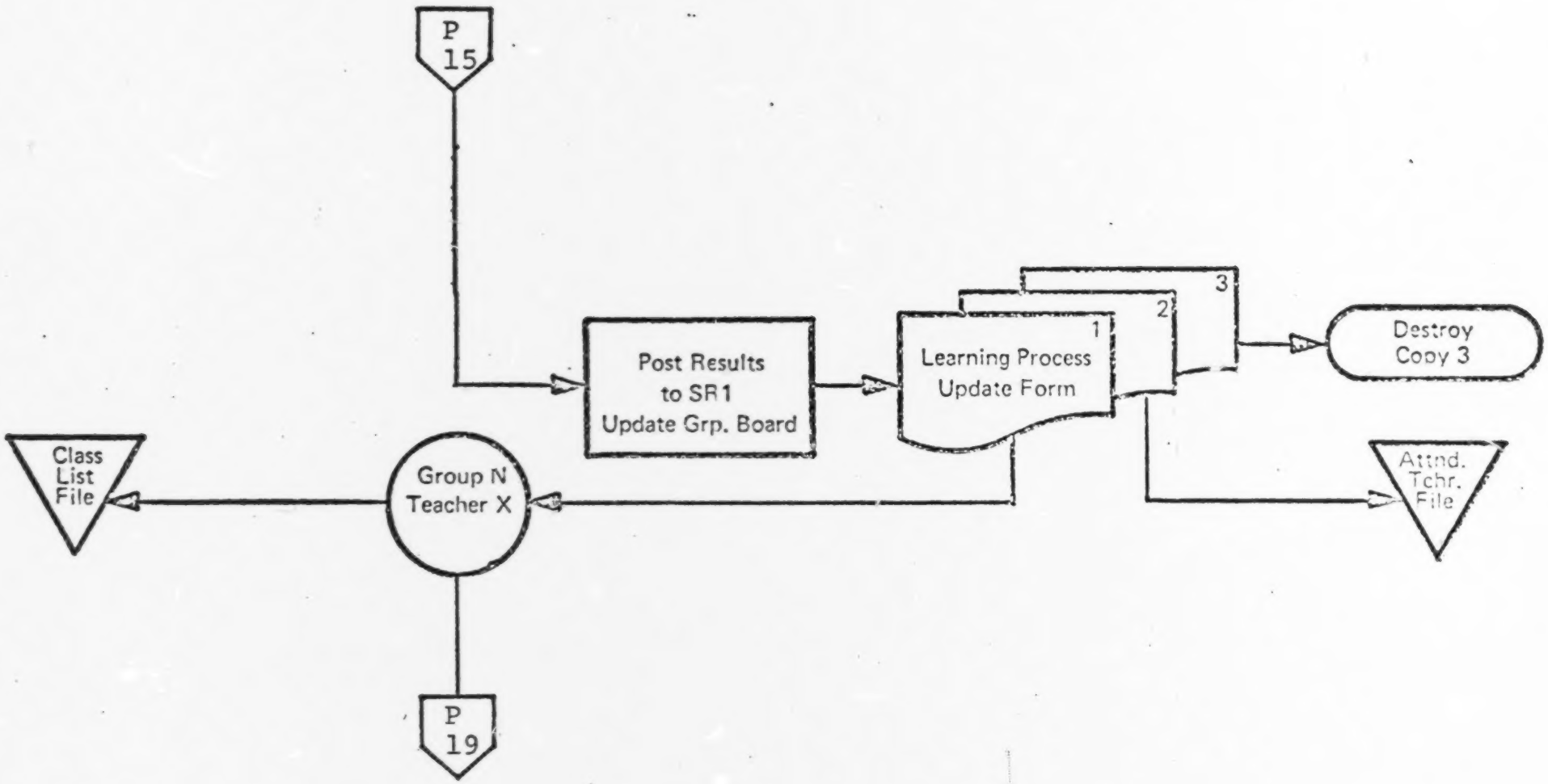
Figure 3 represents the phase of the process in which the student is assigned to a learning group.

Based on the decision of which group the student should join, the results of the test is posted to the student profile and the group board is updated. The group board that is referenced here refers to a magnetic board where the exact status at a given moment of all students could be pictured; that is, which groups are presently in process, and whether or not there is room for this student in a particular group.

The next symbols represent the learning process update form, which is pictured as a form about 3" x 5" and which would indicate the student's name, the group to which he has been assigned, other

Figure 3

PLP


P
15
Post Results
to SR1
Update Grp. Board
Learning Process
Update Form
1
2
3
Destroy
Copy 3
Class
List
File
Group N
Teacher X
Attnd.
Tchr.
File
P
19

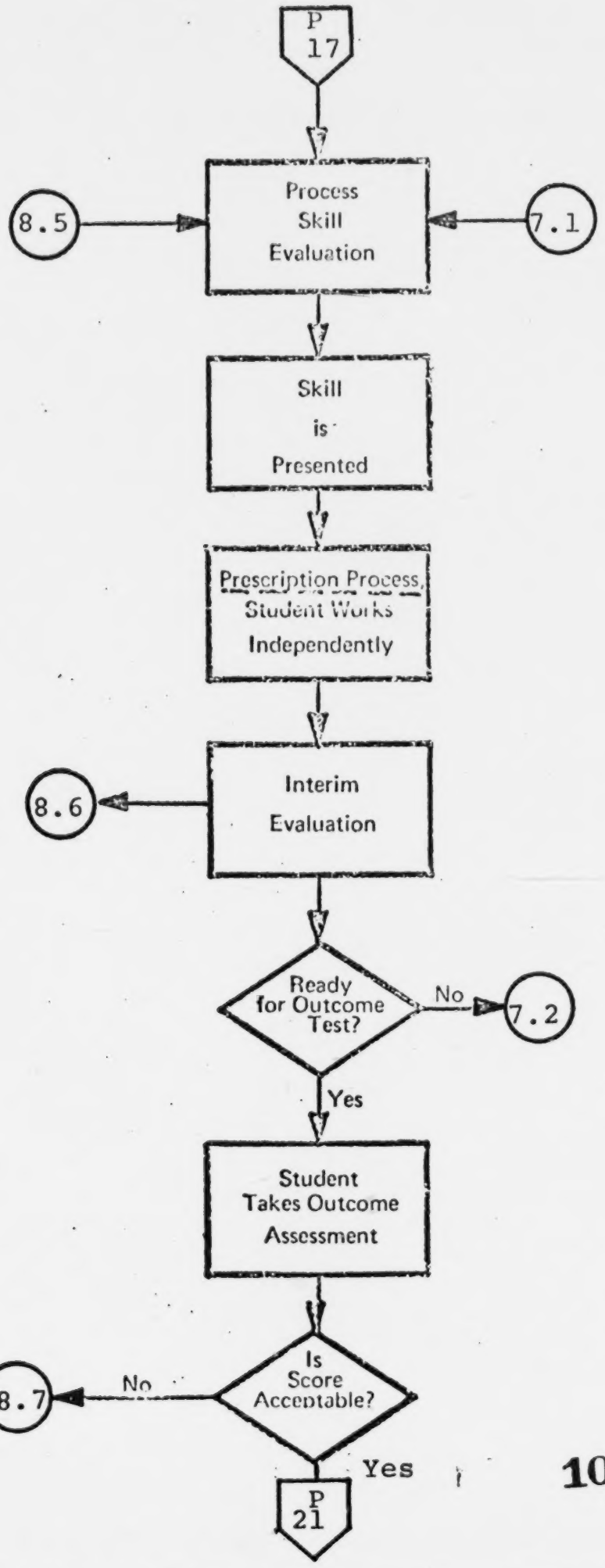
pertinent data, and room for class notes if desired. (It probably would be NCR paper which would not require carbons.) The third copy pictured by the oval is not used at the initial point. It is destroyed. Copy two goes to the attendance teacher or homeroom teacher so that she may at any time know the student's whereabouts for this particular activity. Copy one goes to the group instructor (group N, Instructor X) to which he has been assigned, to be filed in a 3" x 5" card file. It will serve as an updated class list, eliminating the need for typing or handwriting of a class list periodically as the group changes. The form could also be used for the instructor's notes as to the progress of the student in this group.

Figure 4 represents the body of the learning activities. The first activity represents the process skill evaluation which is additional diagnosis of the process skills to pinpoint the areas for which the student needs further development. The next activity represented on the flow chart is the process of the instructor presenting that particular skill. Following it is the prescription process. Here, the instructor is prescribing what reinforcement materials and activities a student should concentrate on.

This could take the form of a contract, a worksheet assignment, a reading assignment, etc., and the student would then

Figure 4

PLP


P
17
Process
Skill
Evaluation
8.5
7.1
Skill
is
Presented
Prescription Process,
Student Works
Independently
Interim
Evaluation
8.6
Ready
for Outcome
Test?
No
7.2
Yes
Student
Takes Outcome
Assessment
Is
Score
Acceptable?
No
8.7
Yes
P
21

pursue these activities independently with the assistance of an instructor as needed.

The next process indicated is that of an interim evaluation. This could be a subjective or an objective evaluation of the worksheets, the assignments that have been made, etc. by the instructor. This also gives an opportunity to suggest that the student might have a physical, mental or social problem that needs to be investigated in the referral process (connector 8.6). Based on the interim evaluation, the decision is made: Is the student ready for the outcome assessment test? The next rectangle indicates the process of the student physically taking the outcome assessment. Then one needs to ask whether or not the score the student has attained is acceptable.

Assuming that an acceptable score on the process skill has been achieved, one must decide the next learning activity for the student (Figure 5). The results of the outcome assessment are posted to the student profile and the group board is updated. The new learning process update form is being filled out and this time the third copy is being used to indicate to the previous group that the student is no longer with that group.

Once new copy 3 is used to locate old copy 1 in the previous group class list file, they both may be destroyed. However, experience may show that these copies are useful for other

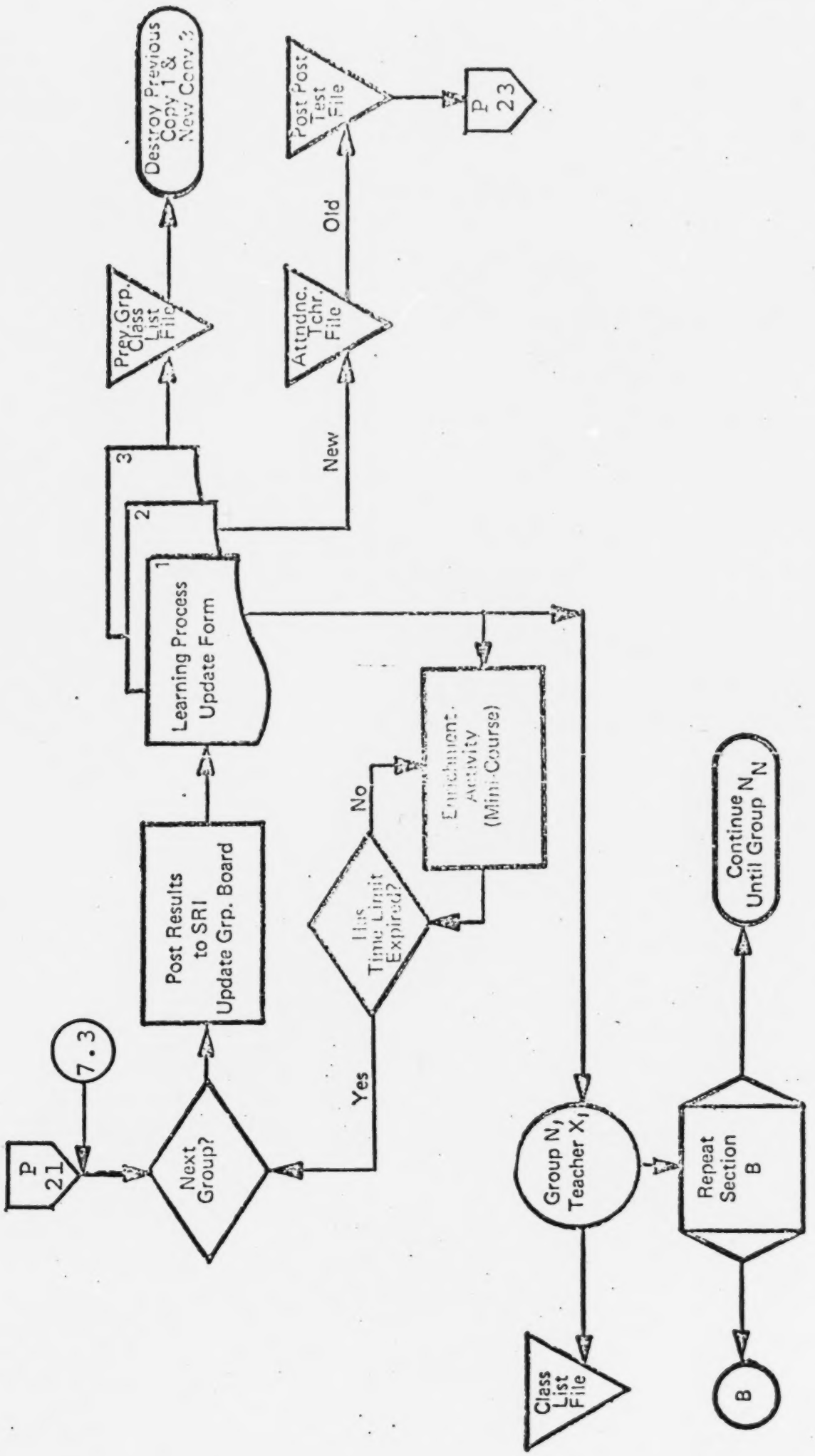

Destroy Previous Copy 1 & New Copy 2
Post Post Test File
P 23
Prev Grp. Class List File
Attndnc. Tchr. File
Old
New
3
2
1
Learning Process Update Form
Post Results to SRI Update Grp. Board
Has Time Limit Expired?
No
Yes
Enrichment Activity (Mini-Course)
P 21
7.3
Next Group?
Group N, Teacher X,
Class List File
Repeat Section B
Continue N Until Group N
B

Figure 5

PLP

functions.

The second copy, (these probably would be a different color for each) goes to the attendance teacher or homeroom teacher and triggers (a) pulling the old copy two from that attendance teacher's present status file, (b) inserting the new one, and (c) filing the old one in the team's posttest file to indicate this group of students' accomplishments for this period of time.

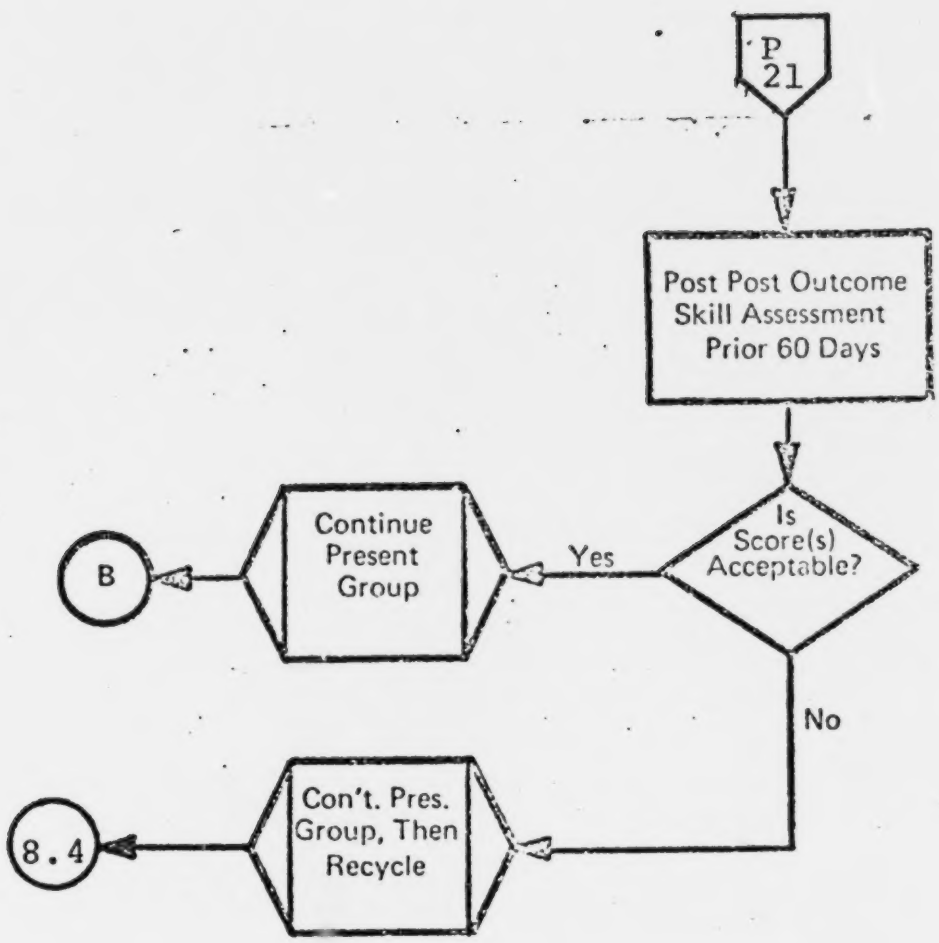
Copy 1 indicates the next activity the student will be involved in. It will be a mini-course or the next appropriate group. Section B of the flow chart is repeated until the student has satisfactorily completed all groups or the time limit has expired (Figure 10).

The next activity is pictured as the post post-outcome skill assessment, which would be a formal assessment to evaluate the student's retention of those skills that he has mastered in the previous sixty days (Figure 6).

This diamond represents the decision of the score's acceptability. Assuming that it is "yes," the student would continue in his present group, no further action is needed; however, if the score is not acceptable the student would continue in his present group until completion, and then re-cycled to reinforce those areas that are needed. It might be

Figure 6

PLP


P
21
Post Post Outcome
Skill Assessment
Prior 60 Days
Is
Score(s)
Acceptable?
Yes
No
Continue
Present
Group
B
Con't. Pres.
Group, Then
Recycle
8.4

well to add at this point that the sixty-day period chosen for the post posttest would recur three times per year, and that possibly everyone in the school would be involved in this activity.

Connector 4.2 (Figure 7) represents a negative answer to the outcome assessment score. If the answer is "no," one checks to see if the time that has been established for this particular function has expired. Assuming that the time limit has not been exceeded, we are following the vertical arrow upward and recycling through the learning process (connector 4.1). This eliminates the possibility of the student getting lost in the system and being locked in to a given skill process.

Assuming that the time limit has expired, the question is asked: Shall the student go into a mini-course (an enrichment activity) or should he go on to the next group?

Assume that the student is to be channeled into the enrichment activity for the present time. It might be a case where the student only needs a change of pace or just a breather.

One would also establish a time limit for this activity. A constant check will be maintained to avoid violation of the time limit. If the time has expired, one needs to decide: Shall the student go back into the same process, or shall he go on to the next group and bypass this particular skill for the present time?

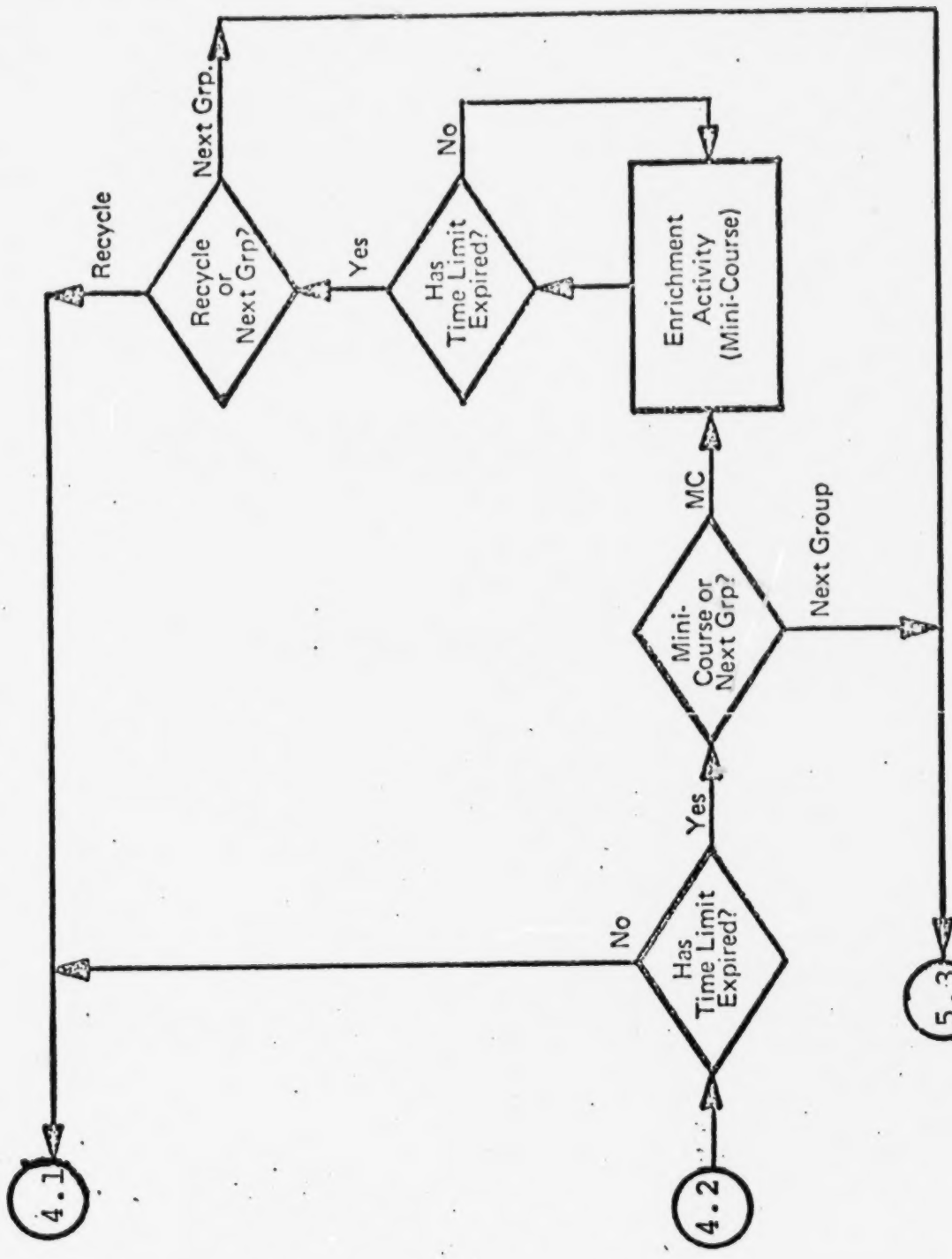

Recycle
Next Grp.
Recycle or Next Grp?
Yes
No
Has Time Limit Expired?
Enrichment Activity (Mini-Course)
MC
Next Group
Mini-Course or Next Grp?
Yes
No
Has Time Limit Expired?
4.1
4.2
5.3

Figure 7
PLP

If we recycled, one can see by the direction of the arrow that he would go back to the skill presentation area (connector 4. 1).

Assuming that he should go on to the next group, follow the path down to the diamond that asks: To which group he should go (connector 5. 3). Backtrack to the point at which decision on the mini-course or the next group was made. If one decided against the mini-course because the student was ready for the next group, one would follow the vertical arrow at the bottom and move to the next group (connector 5. 3).

Is this the student's second time through this particular skill (Figure 8)? If it is, one should not wait; but find out what the student's problem is by automatically channeling him into the referral process. The student referral process is shown in Figure 9. The originator, the instructor in this case, calls the conference team together to decide whether there is, in fact, a problem and how serious the problem is. As can be seen, if the problem is deemed to be a minor one, the process stops; however, should it be a problem that needs to be brought to the parent's attention, a parental conference is called. This relieves the burden of a single instructor deciding whether or not to contact the parents for a particular problem through reinforcement in

the group activity. After the problem is presented to the parents, the decision has to be made: Is further assistance desired? Should the parents say "no," it's obvious that an alternative must be sought. Assuming that the parents say "yes, we desire assistance," maybe Johnny should be checked for this particular problem to see what assistance he can be given. The student referral form is initiated and channeled to the proper activity as represented on the chart. Once the problem has been resolved and the student is ready to proceed in the system, he can re-enter the system and proceed as diagrammed thus far.

At this point one should refer to the diamond where it was decided to initiate the referral process for the student (Figure 8); if it is assumed that this is only the first time through and the student is to be recycled the learning process can be approached in a different manner.

First of all, one needs to determine specifically in which skills the student needs help; this is indicated by the Process Skill Evaluation. Based on this, one needs to decide which skills need emphasis. It is noted on the line going back to the skill presentation (connector 4. 5) that this can be a different teacher and/or process. This reinforces the belief that every student doesn't learn in exactly the same manner; that perhaps a

Figure 8

PLP

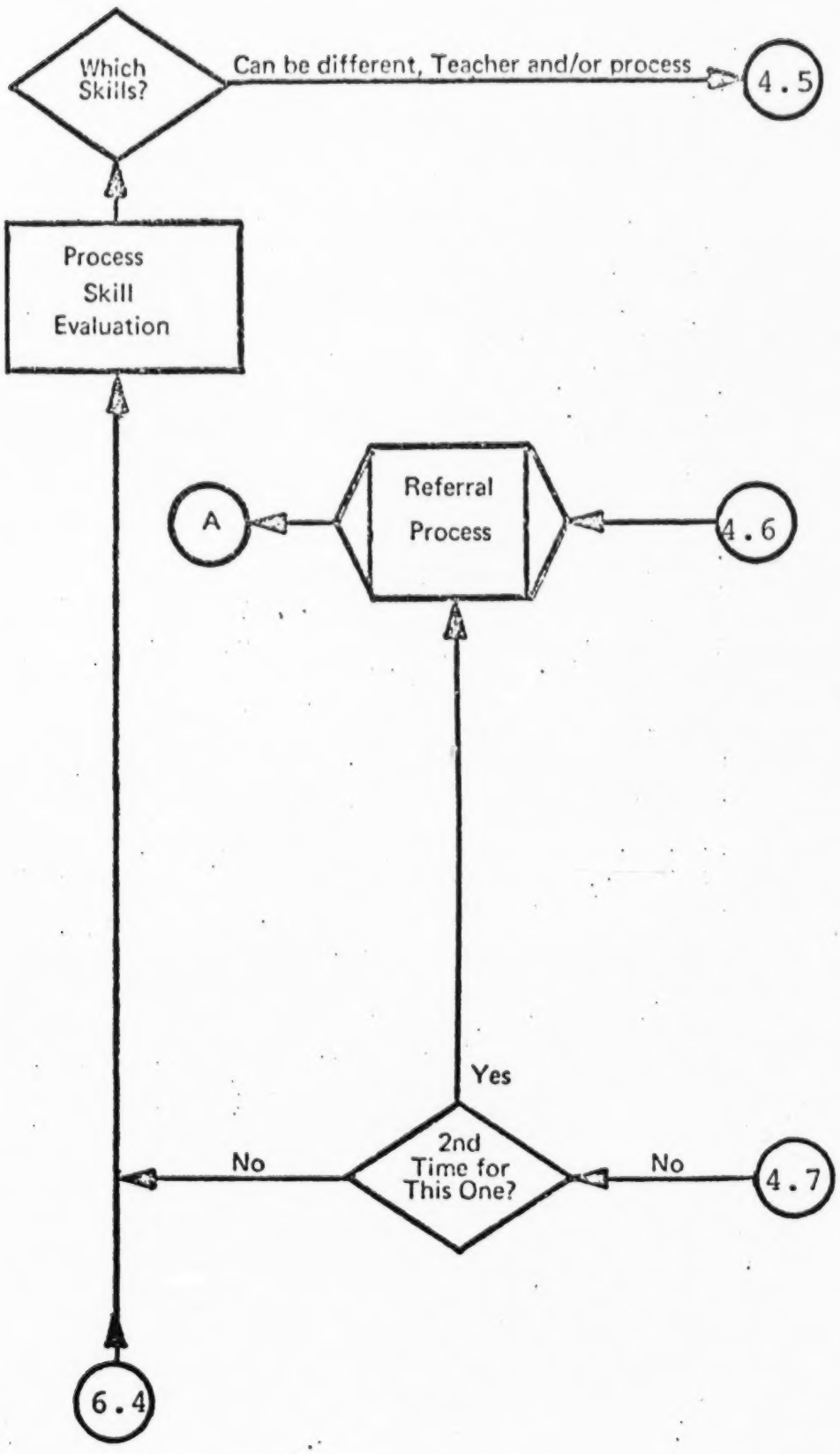
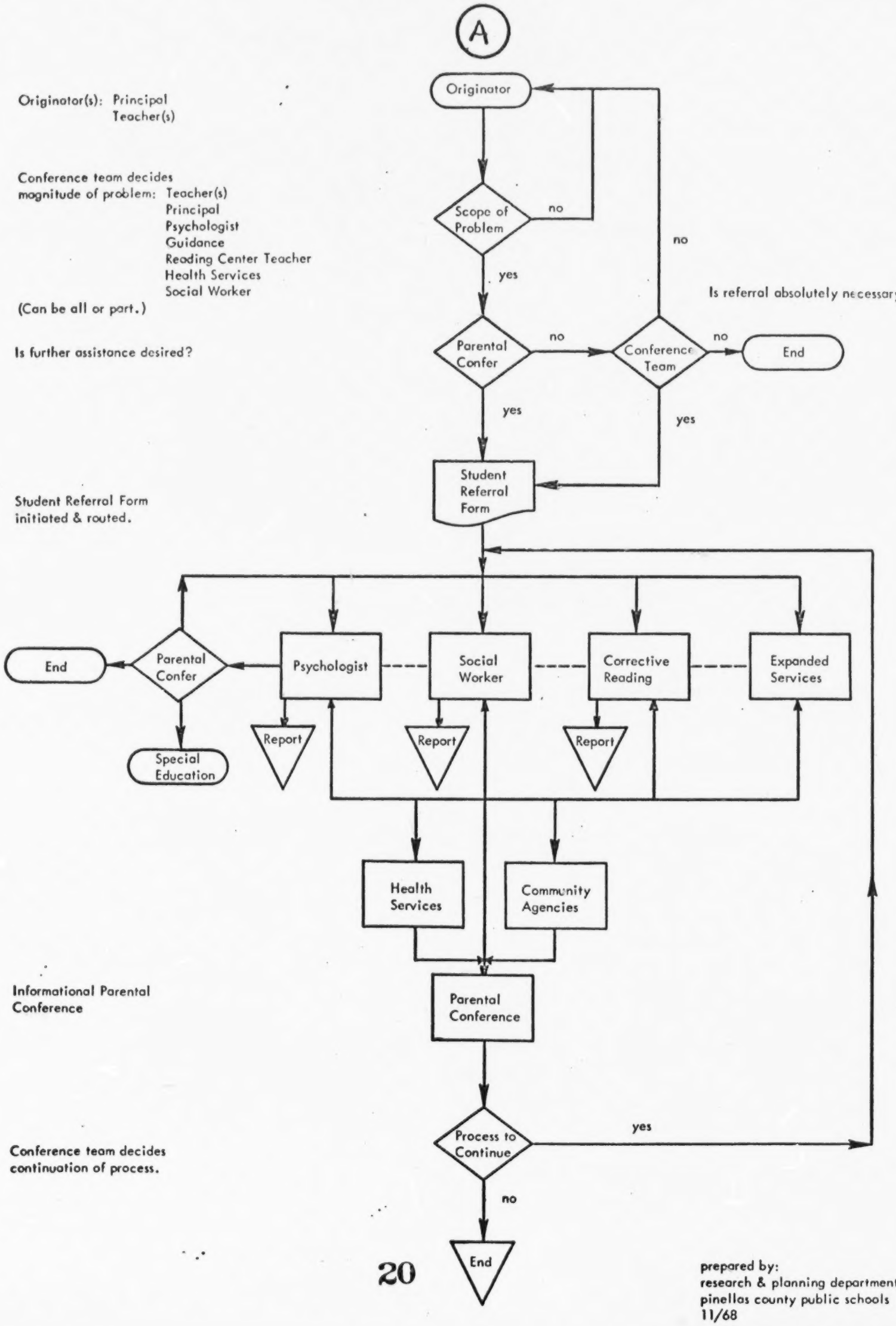

Which Skills?
Can be different, Teacher and/or process
4.5
Process Skill Evaluation
A
Referral Process
4.6
Yes
No
2nd Time for This One?
No
4.7
6.4

Figure 9

REFERRAL & CASE FLOW PROCESS
PUPIL SERVICES DIVISION
PINELLAS COUNTY PUBLIC SCHOOLS



Originator(s): Principal
Teacher(s)

Conference team decides magnitude of problem: Teacher(s)
Principal
Psychologist
Guidance
Reading Center Teacher
Health Services
Social Worker

(Can be all or part.)

Is further assistance desired?

Student Referral Form initiated & routed.

Informational Parental Conference

Conference team decides continuation of process.

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different approach to this particular skill should be provided. This can be accomplished by using a new cycle of presentation, reinforcement and assessment.

The entire personalized learning process is shown in Figure 10.

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PERSONALIZED LEARNING PROCESS

(pretest, diagnose, present, reinforce, assess)

Figure 10

PRE TEST

Oral Test - A subjective analysis of general skill level

Diagnostic Pre Test - An objective written diagnostic test of specific skills to determine which skill group a student will initially be assigned

Process Skill Evaluation - A further diagnosis of process skills to pinpoint areas for further development

PRESENT:

Presentation - Instructor presents learning skill

REINFORCE:

Prescription Process - Instructor prescribes individual student assignment. It can be a contract, worksheet, reading assignment, etc.

Reinforcement - Student works independently on prescription with the assistance of an instructor as needed.

ASSESS:

Interim Evaluation - Student's progress is evaluated via observation, worksheets, etc.

Outcome Assessment - Formal testing of that skill area. The student is advanced, recycled (for reinforcement), or assigned to enrichment activity based on the results of the test.

Post Post Test - A formal assessment to evaluate the student's retention of those skills that he has mastered in the prior 60 days. Reinforcement is provided as necessary.

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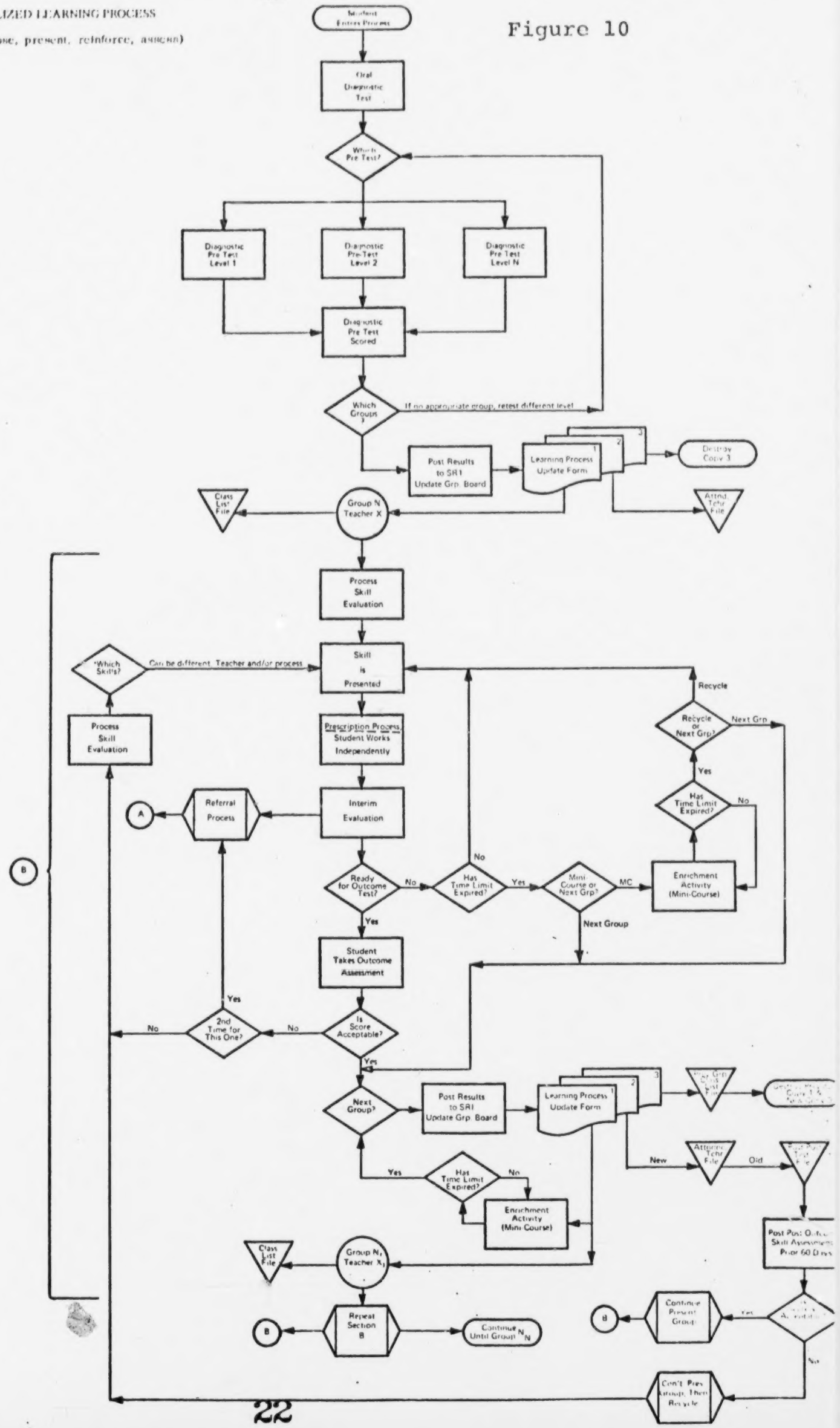


THE PROPOSED CMPLP MODEL

Figure 11 represents the Computer Managed Personalized Learning Process (CMPLP) model.

One can readily envision that the application of the testing, diagnostic, prescription and record keeping processes detailed in the Manual Model readily lend themselves to computerization.

However, the implication of such a system opens the door to those with a vivid imagination. One can picture an instruction area with several informational resource devices:

ETV

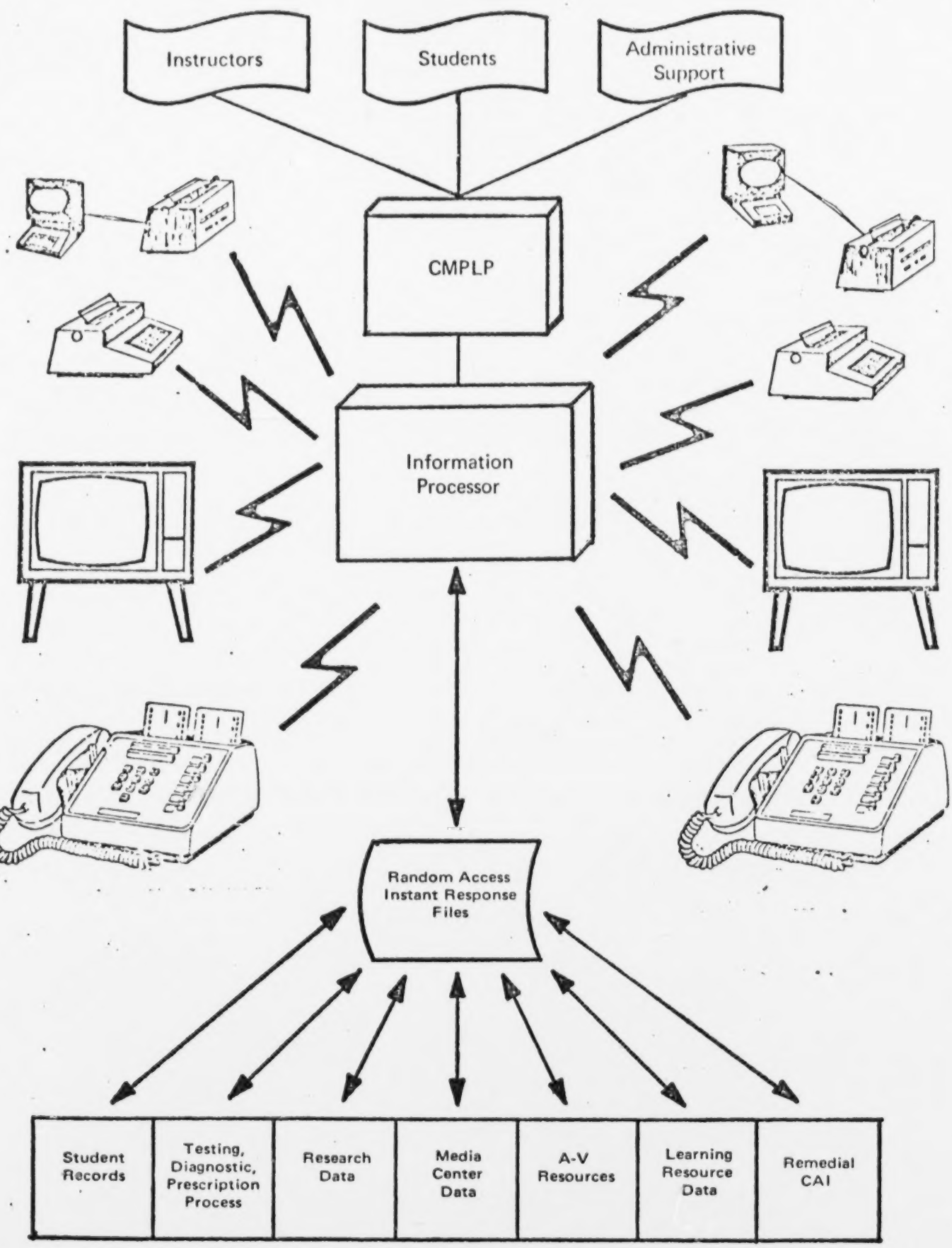
Visual display console, with hard copy capability

Teletype terminals

Telephones

. . . all with immediate response capabilities.

FIGURE 11



Instructional Sub-System
of
Educational Resource Management Information System
ERMIS

The CAI Center at FSU (Hansen, Dick, Lippert, 1969) and numerous other research studies have concluded

> ...that while tutorial CAI is an effective instructional strategy, it is unlikely that, in the short run, it is going to make a significant impact on education because of the cost associated with one student utilizing a terminal for relatively long periods of time during each instructional session.[1]

Dick and Gallagher express the opinion that they feel that other computer strategies such as Computer-Managed Instruction (CMI) probably hold the most future promise. In fact, their latest project utilized the computer playing the role of real-time diagnostician and prescriber for the student as well as record-keeper.

It is the conclusion of this writer that the demands of individualized instruction will dictate computer management of the instructional process. While the CMPLP model pictures complete resource utilization, the final product will at least encompass a majority of the system.

[1]Walter Dick and Paul Gallagher, Systems Concepts and Computer-Managed Instruction, CAI Center Florida State University, April 15, 1971, p. 1.